

**WHAT IS CLAIMED IS:**

- 1           1.       A cathode material comprising an irreversible high capacity material and a  
2 reversible low capacity material.
- 1           2.       The cathode material of claim 1, wherein the reversible low capacity material  
2 includes a lithiated manganese dioxide.
- 1           3.       The cathode material of claim 1, wherein the irreversible high capacity  
2 material includes a carbon fluoride.
- 1           4.       The cathode material of claim 2, wherein the irreversible high capacity  
2 material includes a carbon fluoride.
- 1           5.       The cathode material of claim 4, wherein the lithiated manganese dioxide and  
2 the carbon fluoride are blended.
- 1           6.       The cathode material of claim 4, wherein the lithiated manganese dioxide  
2 includes an electrolytic manganese dioxide or a chemical manganese dioxide.
- 1           7.       The cathode material of claim 4, wherein the carbon fluoride is  $CF_x$ .
- 1           8.       The cathode material of claim 4, wherein the lithiated manganese dioxide and  
2 the carbon fluoride are present in a ratio in the range of 1:99 to 99:1 by weight.
- 1           9.       The cathode material of claim 4, wherein the lithiated manganese dioxide and  
2 the carbon fluoride are present in a ratio in the range of 5:95 to 95:5 by weight.
- 1           10.      The cathode material of claim 4, wherein the lithiated manganese dioxide and  
2 the carbon fluoride are present in a ratio in the range of 25:75 to 75:25 by weight.
- 1           11.      The cathode material of claim 4, wherein the lithiated manganese dioxide and  
2 the carbon fluoride are present in a ratio in the range of 20:80 to 80:20 by weight.

1           12.     The cathode material of claim 2, wherein the lithiated manganese dioxide  
2 includes a low surface area lithiated manganese dioxide.

1           13.     The cathode material of claim 11, wherein the low surface area lithiated  
2 manganese dioxide has a specific surface area of between 0.50 and 20.0 m<sup>2</sup>/g.

1           14.     The cathode material of claim 11, wherein the low surface area lithiated  
2 manganese dioxide has a specific surface area of between 10.0 and 15.0 m<sup>2</sup>/g.

1           15.     A cathode material comprising a low surface area lithiated manganese  
2 dioxide.

1           16.     The cathode material of claim 14, wherein the low surface area lithiated  
2 manganese dioxide has a specific surface area of between 0.50 and 20.0 m<sup>2</sup>/g.

1           17.     The cathode material of claim 14, wherein the low surface area lithiated  
2 manganese dioxide has a specific surface area of between 10.0 and 15.0 m<sup>2</sup>/g.

1           18.     The cathode material of claim 14, wherein the low surface area lithiated  
2 manganese dioxide, when mixed with an electrolyte including an organic solvent and a  
3 lithium salt, produces a gas pressure of no more than 16 PSI after 100 hours at 70 °C.

1           19.     A primary lithium battery comprising:  
2         a cathode including an irreversible high capacity material and a reversible low capacity  
3 material;  
4         an anode including lithium; and  
5         a separator between the cathode and the anode.

1           20.     The battery of claim 18, wherein the reversible low capacity material includes  
2 a lithiated manganese dioxide.

1           21.     The battery of claim 19, wherein the lithiated manganese dioxide includes an  
2 electrolytic manganese dioxide or a chemical manganese dioxide.

1           22.     The battery of claim 19, wherein the battery delivers a capacity at least 40%  
2 greater than the sum of the expected capacities of the lithiated manganese dioxide and the  
3 irreversible high capacity material under high drain conditions.

1           23.     The battery of claim 18, wherein the irreversible high capacity material  
2 includes a carbon fluoride.

1           24.     The battery of claim 19, wherein the irreversible high capacity material  
2 includes a carbon fluoride.

1           25.     The battery of claim 23, wherein the lithiated manganese dioxide and the  
2 carbon fluoride are blended.

1           26.     The battery of claim 23, wherein the carbon fluoride is  $CF_x$ .

1           27.     The battery of claim 23, wherein the lithiated manganese dioxide and the  
2 carbon fluoride are present in a ratio in the range of 1:99 to 99:1 by weight.

1           28.     The battery of claim 23, wherein the lithiated manganese dioxide and the  
2 carbon fluoride are present in a ratio in the range of 5:95 to 95:5 by weight.

1           29.     The battery of claim 23, wherein the lithiated manganese dioxide and the  
2 carbon fluoride are present in a ratio in the range of 25:75 to 75:25 by weight.

1           30.     The battery of claim 23, wherein the lithiated manganese dioxide and the  
2 carbon fluoride are present in a ratio in the range of 20:80 to 80:20 by weight.

1           31.     The battery of claim 23, further comprising an electrolyte including an organic  
2 solvent.

1           32.     The battery of claim 23, wherein the lithiated manganese dioxide includes a  
2 low surface area lithiated manganese dioxide.

1           33.     The battery of claim 30, wherein the low surface area lithiated manganese  
2 dioxide has a specific surface area between 0.50 and 20.0 m<sup>2</sup>/g.

1           34.     The battery of claim 30, wherein the low surface area lithiated manganese  
2 dioxide has a specific surface area between 10.0 and 15.0 m<sup>2</sup>/g.

1           35.     The battery of claim 30, wherein the low surface area lithiated manganese  
2 dioxide, when mixed with an electrolyte including an organic solvent and a lithium salt,  
3 produces a gas pressure of no more than 16 PSI after 100 hours at 70 °C.

1           36.     The battery of claim 30, wherein the lithiated manganese dioxide and the  
2 carbon fluoride are present in a ratio in the range of 1:99 to 99:1 by weight.

1           37.     The battery of claim 30, wherein the lithiated manganese dioxide and the  
2 carbon fluoride are present in a ratio in the range of 5:95 to 95:5 by weight.

1           38.     The battery of claim 30, wherein the lithiated manganese dioxide and the  
2 carbon fluoride are present in a ratio in the range of 25:75 to 75:25 by weight.

1           39.     The battery of claim 30, wherein the lithiated manganese dioxide and the  
2 carbon fluoride are present in a ratio in the range of 20:80 to 80:20 by weight.

1           40.     The battery of claim 30, further comprising an electrolyte including an organic  
2 solvent.

1           41.     A primary lithium battery comprising:  
2 a cathode including a low surface area lithiated manganese dioxide;  
3 an anode including lithium; and  
4 a separator between the cathode and the anode.

1           42.     The battery of claim 38, wherein the low surface area lithiated manganese  
2 dioxide has a specific surface area between 0.50 and 20.0 m<sup>2</sup>/g.

1           43.     The battery of claim 38, wherein the low surface area lithiated manganese  
2     dioxide has a specific surface area between 10.0 and 15.0 m<sup>2</sup>/g.

1           44.     The battery of claim 38, further comprising an electrolyte including an organic  
2     solvent.

1           45.     The battery of claim 38, wherein the low surface area lithiated manganese  
2     dioxide, when mixed with an electrolyte including an organic solvent and a lithium salt,  
3     produces a gas pressure of no more than 16 PSI after 100 hours at 70 °C.

1           46.     A method of manufacturing a cathode active material comprising combining  
2     an irreversible high capacity material and a reversible low capacity material.

1           47.     The method of claim 43, wherein the reversible low capacity material includes  
2     a lithiated manganese dioxide.

1           48.     The method of claim 43, wherein the irreversible high capacity material  
2     includes a carbon fluoride.

1           49.     The method of claim 44, wherein the irreversible high capacity material  
2     includes a carbon fluoride.

1           50.     A method of manufacturing a primary battery comprising combining a  
2     lithiated manganese dioxide and a carbon fluoride to form a cathode material.

1           51.     The method of claim 47, wherein the carbon fluoride is CF<sub>x</sub>.

1           52.     The method of claim 47, further comprising forming a cathode including the  
2     cathode material.

1           53.     The method of claim 49, further comprising assembling the cathode with an  
2     anode including lithium in a housing.

1           54.     The method of claim 50, further comprising assembling the cathode with an  
2 electrolyte including an organic solvent in the housing.

1           55.     The method of claim 47, wherein the lithiated manganese dioxide includes a  
2 low surface area lithiated manganese dioxide.

1           56.     The method of claim 52, wherein the low surface area lithiated manganese  
2 dioxide has a specific surface area between 0.50 and 20.0 m<sup>2</sup>/g.

1           57.     The method of claim 52, wherein the low surface area lithiated manganese  
2 dioxide has a specific surface area between 10.0 and 15.0 m<sup>2</sup>/g.

1           58.     A method of manufacturing a primary battery comprising forming a cathode  
2 material including a low surface area lithiated manganese dioxide.

1           59.     The method of claim 55, wherein the low surface area lithiated manganese  
2 dioxide has a specific surface area between 0.50 and 20.0 m<sup>2</sup>/g.

1           60.     The method of claim 55, wherein the low surface area lithiated manganese  
2 dioxide has a specific surface area between 10.0 and 15.0 m<sup>2</sup>/g.